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DIV :	**SE CE Div A**
DAA Expt 9 Approximation algorithms (The vertex-cover problem)	

AIM :	Approximation algorithms (The vertex-cover problem)
ALGORITHM :	1) A vertex cover of an undirected graph is a subset of its vertices such that for every edge (u, v) of the graph, either ‘u’ or ‘v’ is in the vertex cover. 2) Time Complexity : ◦ O(n^3 3) Algorithm : • Initialize the result as {} • Consider a set of all edges in given graph. Let the set be E. • Do following while E is not empty ◦ Pick an arbitrary edge (u, v) from set E and add 'u' and 'v' to result ◦ Remove all edges from E which are either incident on u or v. • Return result

CODE :	#include<stdio.h>
	#include<stdbool.h>
	
	// Define the maximum number of vertices
	#define MAX_VERTICES 1000
	
	// Define a structure to represent a graph
	typedef struct {
	int edges[MAX_VERTICES][MAX_VERTICES];
	int num_vertices;
	int num_edges;
	} graph_t;
	
	// Function to read in the graph
	void read_graph(graph_t* graph) {
	int i, j, v1, v2;
	
	printf("Enter the number of vertices: ");
	scanf("%d", &(graph->num_vertices));
	
	printf("Enter the number of edges: ");
	scanf("%d", &(graph->num_edges));

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    // Initialize all edges to 0
    for (i = 0; i < MAX_VERTICES; i++) {
        for (j = 0; j < MAX_VERTICES; j++) {
            graph->edges[i][j] = 0;
        }
    }

    // Read in the edges
    printf("Enter the edges (v1 v2): \n");
    for (i = 0; i < graph->num_edges; i++) {
        scanf("%d %d", &v1, &v2);
        graph->edges[v1][v2] = 1;
        graph->edges[v2][v1] = 1;
    }
}

// Function to find the vertex cover using a simple approximation algorithm
void vertex_cover(graph_t* graph) {
    int i, j;
    bool visited[MAX_VERTICES] = {false};

    // Traverse the edges and mark the vertices that are connected
    for (i = 0; i < graph->num_vertices; i++) {
        for (j = 0; j < graph->num_vertices; j++) {
            if (graph->edges[i][j] == 1) {
                visited[i] = true;
                visited[j] = true;
            }
        }
    }

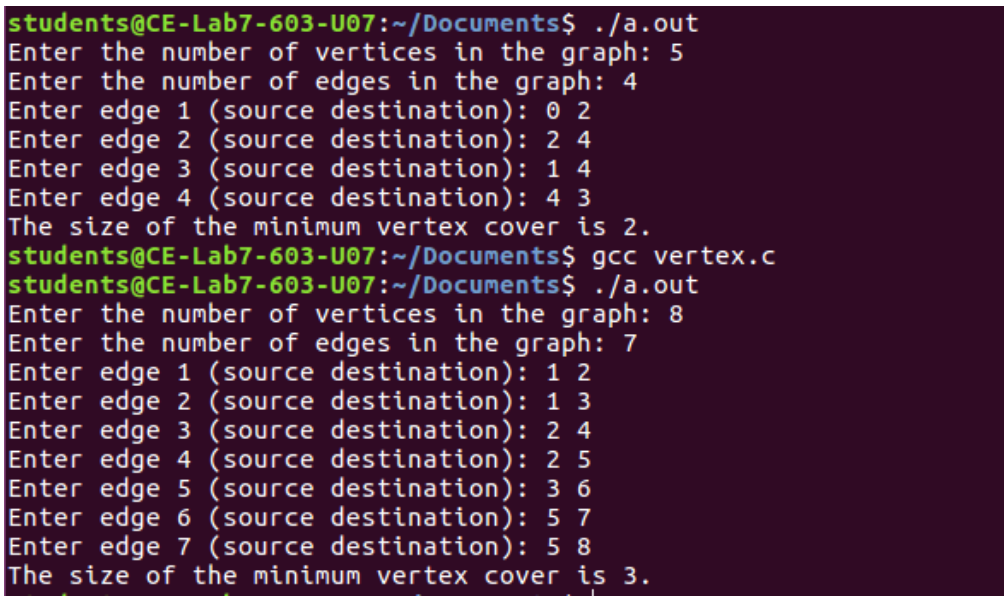
    // Print out the vertex cover
    printf("Vertex Cover: ");
    for (i = 0; i < graph->num_vertices; i++) {
        if (visited[i]) {
            printf("%d ", i);
        }
    }
    printf("\n");
}

// Main function
int main() {
    graph_t graph;

    // Read in the graph
    read_graph(&graph);

    // Find the vertex cover
    vertex_cover(&graph);

    return 0;
```

	}
OUTPUT :	
CONCLUSION :	By Performing the above experiment , Ive understood the code and algorithm of Vertex Cover Problem